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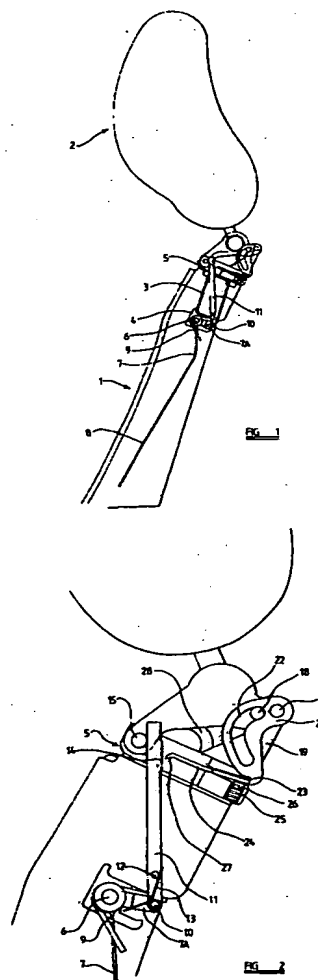
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(54) Abstract Title: **MOVABLE HEADREST AND BACKREST IN RESPONSE TO A REAR IMPACT**

(57) A safety arrangement for a motor vehicle is intended to reduce or eliminate "whiplash" injuries inflicted on necks of vehicle occupants. A head-rest arrangement 2 mounted on a vehicle seat incorporates a head-rest 2 and a mechanism to move the head-rest 2 forwardly from its initial position to a forward position, to meet the head of an occupant. The mechanism is associated with an initiator arrangement which may be in the form of a releasable catch 24 biased by a spring 25, is operable to initiate the forward movement of the head-rest 2. A back-rest 1 of the seat includes a member which may be a pressure plate 8, is movable in response to pressure applied (for example under the inertia of the seat occupant) to the back-rest 1 of the seat. That member is associated with an inertia-sensitive connection which is normally disconnected but which, with an inertia effect in the even of an accident, may become connected to the initiator such that movement of the said member in the back-rest 1 of the seat serves to actuate the initiator and thereby cause the head-rest 2 to move forwardly towards the head of the seat occupant. The catch 24 may include a catch plate 21 having a slot 22 in order for a pin 18 to facilitate movement of the headrest 2.



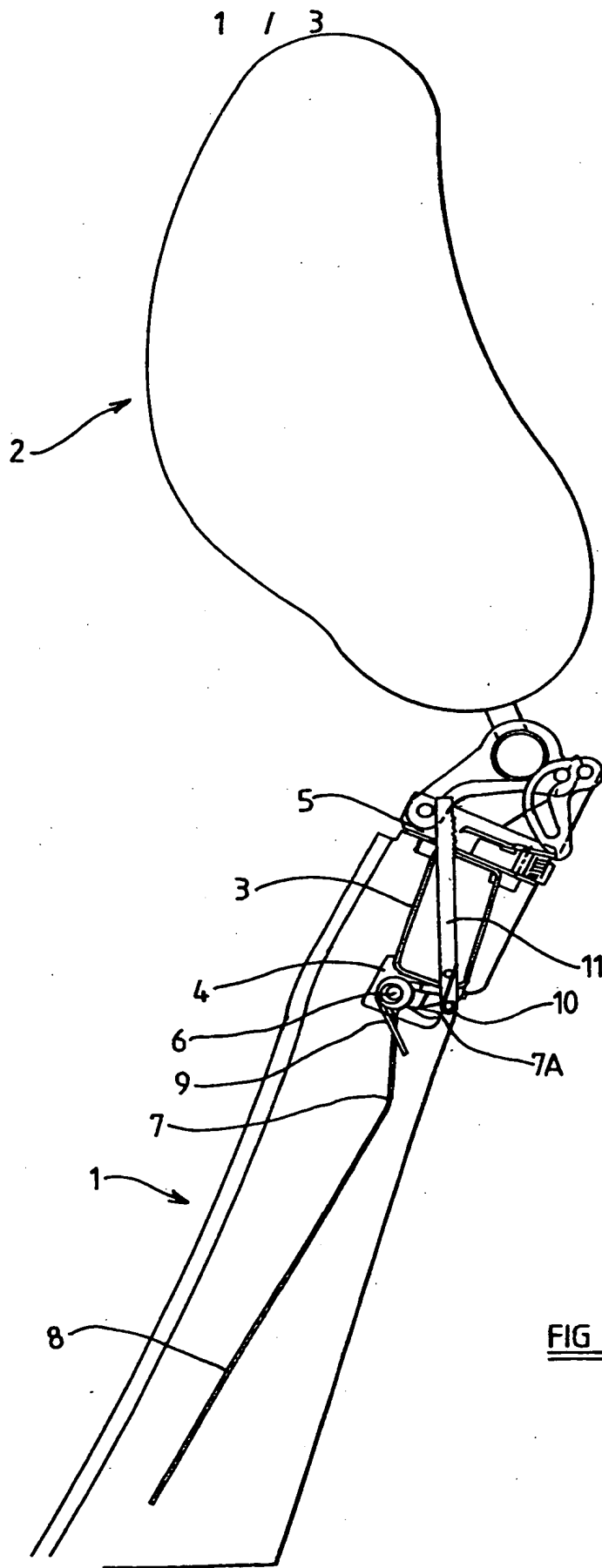


FIG 1

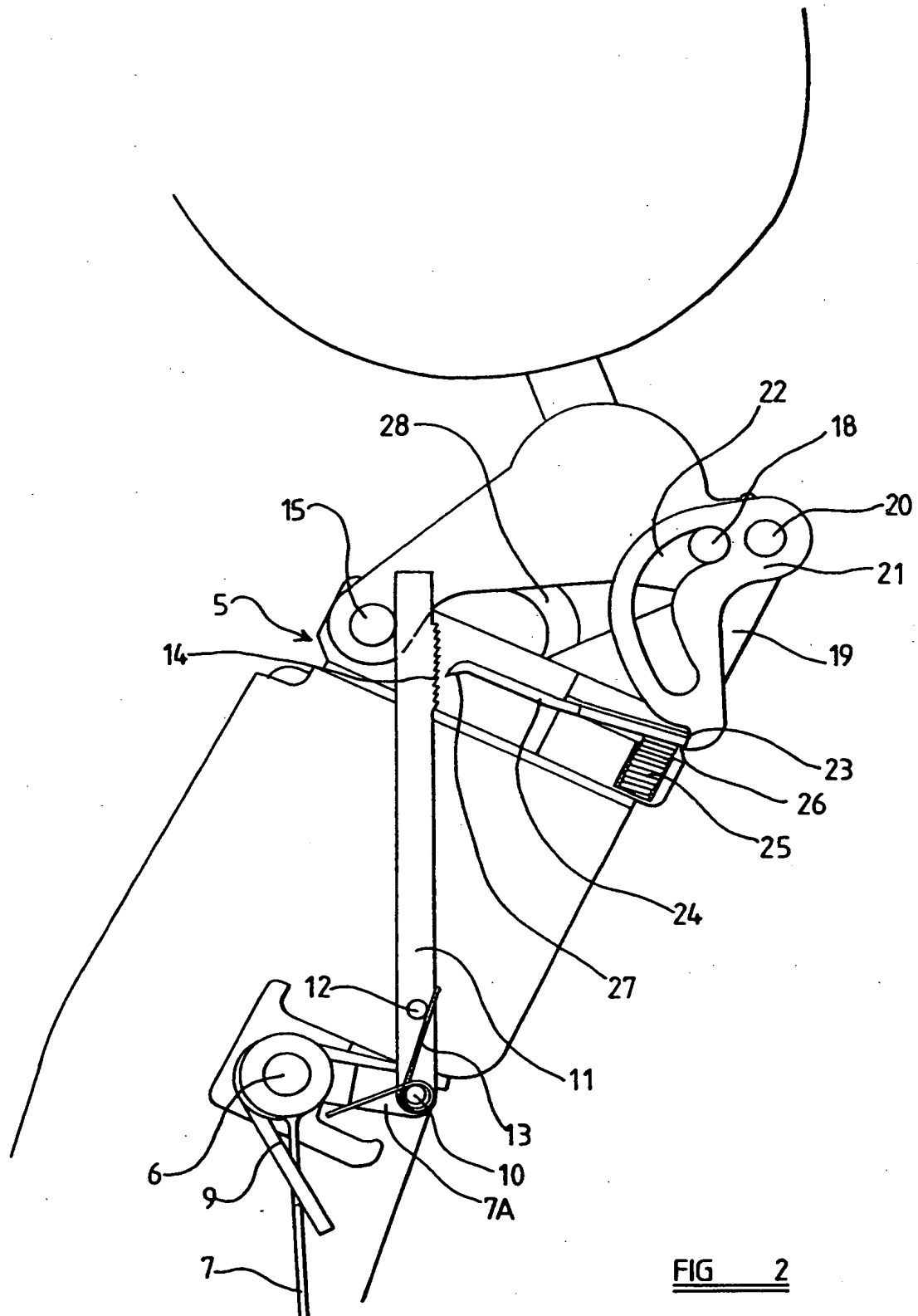
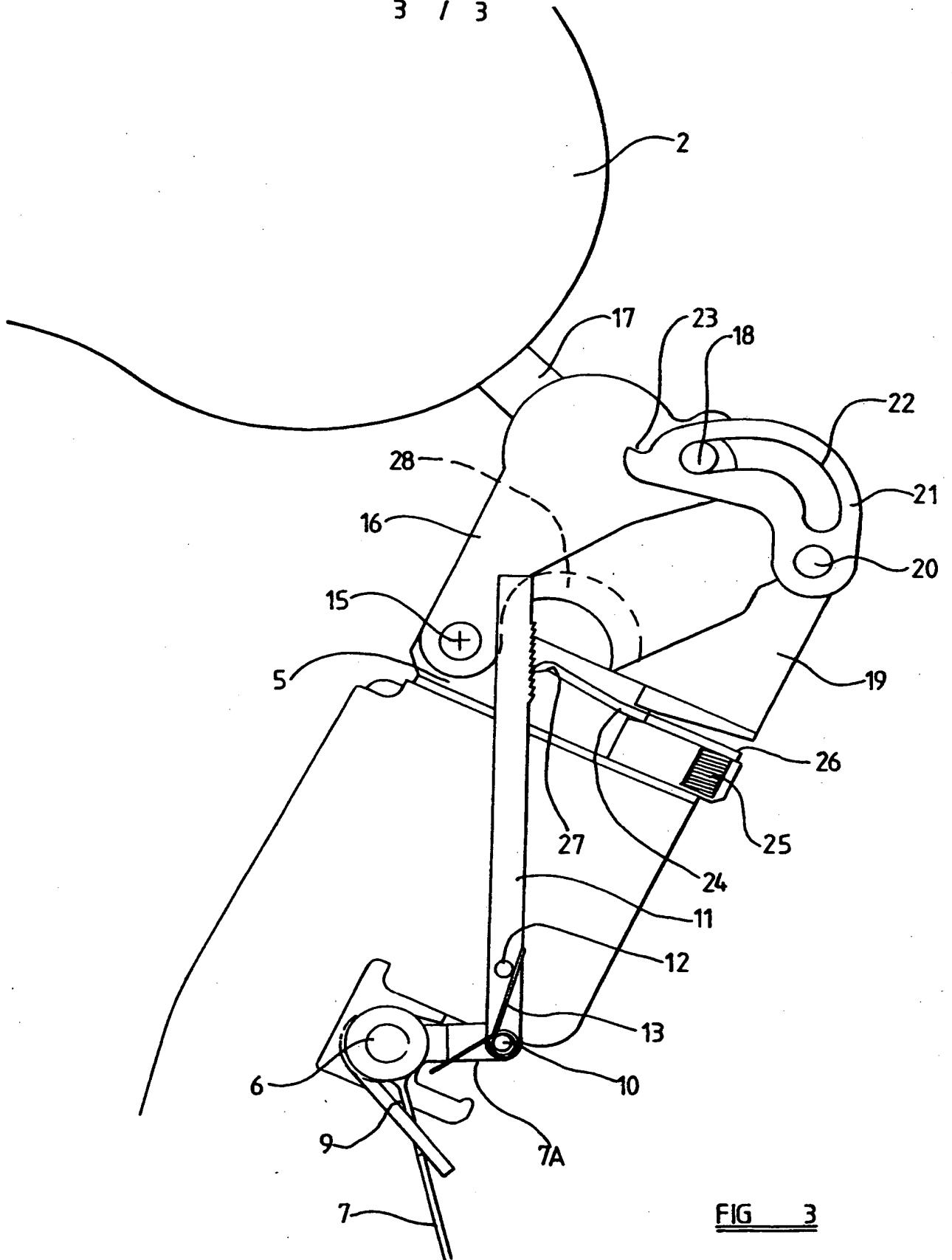


FIG 2

FIG 3

5 DESCRIPTION OF INVENTION

**"IMPROVEMENTS IN OR RELATING TO A HEAD-REST
ARRANGEMENT"**

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THE PRESENT INVENTION relates to a head-rest arrangement, and more particularly relates to a head-rest arrangement for use with a vehicle seat.

15 If a vehicle is stationary, and is then struck from behind, thus being involved in a "rear impact" situation, the vehicle is given a very sudden forward acceleration. The seats within the vehicle thus move forwardly and impart a very rapid acceleration to the torso of the seat occupants. However, the head of a seat occupant, because of inertia, tends to remain stationary until the torso of
20 the occupant has moved forward by such a distance that the neck of the occupant begins to apply a force to the head. This force may initially cause the head of the occupant to rotate rather than accelerate forwardly. The neck of the occupant is distorted and subjected to relatively high forces as the torso of the occupants move forwardly, giving rise to so-called "whiplash" injuries.

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Various arrangements have been proposed in which, during a rear impact, at least part of a head-rest provided on a vehicle seat moves forwardly to "catch" the rear part of the head of the seat occupant and thus to apply an acceleration to the head of the seat occupant which is generally similar to the

acceleration applied to the torso of the seat occupant. In this way the head and the torso move forwardly with substantially the same acceleration, and thus the neck of the occupant does not become distorted and is not subjected to severe forces.

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It has been thought possible that the forward movement of the head-rest may be actuated by a pressure plate located within the back-rest of the seat in such a way that during a rear impact situation, the force exerted on the back-rest of the seat by the torso of the seat occupant will move the plate rearwardly within the seat, thus triggering a forward movement of the head-rest. However, it is now thought that an arrangement of this type might be inadvertently triggered if, for example, a seat occupant initially sits "heavily" on a vehicle seat.

15 The present invention seeks to provide an improved head-rest arrangement.

According to the present invention, there is provided a head-rest arrangement mounted on a vehicle seat, the head-rest arrangement incorporating a head-rest and a mechanism to move the head-rest forwardly from an initial position to a forward position, the mechanism being associated with an initiator operable to initiate the forward movement of the head-rest, the back-rest of the seat including a member moveable in response to pressure applied to the back-rest of the seat, that member being associated with an inertia sensitive connection which is normally disconnected but which, with an inertia effect, may become connected to the said initiator such that movement of said member in the back-rest of the seat actuates the initiator to cause the head-rest to move forwardly.

Preferably, the initiator constitutes a releasable catch, the head-rest being biased forwardly by means of a spring.

5 Advantageously, the head-rest is mounted for pivotal movement about a predetermined pivot axis, and the catch incorporates a pivotally mounted catch plate having a slot therein, the slot co-operating with a pin carried by the head-rest, the catch plate being associated with a catch element positioned to retain the catch in an initial position such that the engagement between the pin and the
10 slot serves to retain the head-rest in the first position, the catch element being moveable to a release position in which the catch plate is free to move pivotally, thus enabling the head-rest to move forwardly as the pin moves along said slot.

15 Conveniently, the catch element is pivotally mounted, one end of the catch element constituting the part of the initiator that is engaged by the said inertia sensitive connection

 Preferably, the inertia sensitive connection comprises an element that is
20 pivotally mounted to the said member within the back-rest, and which is initially biased to a position in which the member is spaced from part of the initiator, the member being movable, under inertia, to a position in which part of the member engages the said part of the initiator to constitute a connection such that movement of the member actuates the initiator.

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 Advantageously, said element is an elongate element provided with a serrated face to engage said part of the initiator.

Conveniently, the said element is resiliently based to the first position.

5 In order that the invention may be more readily understood, and so that further features thereof may be appreciated, an embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

10 FIGURE 1 is a diagrammatic side view of part of a back-rest of a seat provided with a head-rest arrangement in accordance with the invention, showing the head-rest in an initial position,

FIGURE 2 is an enlarged view of part of Figure 1, and

15 FIGURE 3 is a view, corresponding to Figure 2, illustrating the head-rest arrangement when the head-rest arrangement has been "triggered" with the head-rest having been moved to a forward position.

20 Referring initially to Figure 1 of the accompanying drawings, a back-rest 1 of a vehicle seat is provided with a head-rest 2. The back-rest 1 includes an upper horizontal generally tubular frame member 3 (shown in cross-section in Figure 1). The frame member 3 carries, on its lower surface, a first support bracket 4 and carries, on its upper surface, a second support bracket 5.

25 The first support bracket 4 carries a first pivot axis 6 which pivotally supports a depending arm 7 which terminates with a pressure plate 8, the pressure plate 8 being located towards the centre of the back-rest 1 of the seat. The upper end of the arm 7 carries a rearwardly extending ear 7A. A torsion spring 9 is provided, associated with the pivot 6, which tends to bias the support

arm 7 and thus the pressure plate 8 forwardly relative to the structure of the back-rest 1. The pressure plate 8 may move rearwardly, within the back-rest 1, against the bias provided by the torsion spring 9.

5 As illustrated most clearly in Figure 2, the rear-most end of the ear 7A defines a second pivot axis 10. An elongate upwardly extending connection bar 11 is provided, the lower end of which is pivotally connected to the second pivot axis 10. Adjacent the second pivot axis 10 the connecting bar 11 is provided with a horizontally projecting pin 12, the pin 12 being engaged by a
10 second torsion spring 13 which is associated with the second pivot axis 10. The second torsion spring 13 tends to bias the connecting rod 11 forwardly relative to the back-rest 1 of the seat. An upper part of the connecting rod 11 is provided with serrations or teeth 14 provided for a purpose that will become clear from the following description.

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 The upper support bracket 5, defines a mounting pivot 15, to which is pivoted part of a head-rest support plate 16. The head-rest support plate 16 is connected by means of support bars 17 to the head-rest 2.

20 The support plate 16 is provided with a horizontally-extending pin 18 provided for a purpose which will become clear from the following description.

 The upper support bracket 5 also carries an upstanding mounting plate 19, the mounting plate 19 being provided with a pivot axis 20 which pivotally
25 supports a catch plate 21. The catch plate 21 is provided with an arcuate slot 22 therein, the horizontally-extending pin 18 provided on the support plate 16 being trapped within the arcuate slot 22. Part of the catch plate 21 remote from the pivot 20 is provided with an abutment face 23.

A catch element 24 is mounted on the upper support bracket 5 to effect a pivotal movement against the bias provided by a spring 25. The catch element 24 has a first end 26 which, as will become clear, engages the abutment face 23 of the catch plate 21, and also has an opposed toothed end 27 adapted to engage the serrations 14 provided on the connection bar 11.

The support plate 16 is associated with a further biasing spring 28 only partially visible in Figure 2, the spring 28 serving to impart a forward rotational bias to the support plate 16 about the mounting pivot 15.

When the head-rest arrangement is in an initial or "normal" condition, as shown in Figure 2, the connection bar 11 is biased forwardly by the second torsion spring 13 to an initial position in which the bar 11 engages and is retained by part of the mounting pivot 15 provided on the upper support bracket 5.

The catch element 24 is in an initial position with the first end 26 thereof in engagement with the abutment face 23 provided on the catch plate 21. The catch plate 21 is thus prevented from rotating (in the orientation shown) in the clockwise sense about the pivot 20. The pin 18 is retained at one end of the arcuate slot 22. Forward movement of the head-rest 2 about the mounting pivot 15 under the effect of the spring 28 is therefore prevented. It is to be observed that the toothed end 27 of the catch element 24 is spaced from the teeth or serrations 14 provided on the connection bar 11.

It is to be appreciated that in the condition of the head-rest arrangement illustrated in Figure 2, should a seat occupant sit "heavily" on the seat, whilst pressure may be applied to the pressure plate 8, causing the arm 7 to move

rearwardly and thus causing the ear 7A to pivot upwardly relative to the first pivot axis 6, against the bias provided by the first torsion spring 9, the only effect of this movement of the pressure plate 8 will be to move the connection bar 11 upwardly. The connection bar is totally disconnected from the catch element 24.

However, should a vehicle in which the described head-rest arrangement is mounted, be involved in a rear impact, the back-rest 1 will tend to move forwardly, and the connection bar 11, due to its inertia, will tend to pivot rearwardly, or in a clockwise direction as shown in Figure 2, thus bringing the serrations 14 into engagement with the toothed end of the catch element 24, in the manner of an inertia sensitive connection. Should the seat be occupied, the torso of the seat occupant will apply a force to the pressure plate 8, thus tending to move the mounting arm 7 rearwardly about the pivot axis 6, consequently driving the ear 7A upwardly, and moving the connection bar 11 upwardly. Since the connection bar 11 has the serrations 14 thereof engaged with the toothed end 27 of the catch element 24, the catch element 24 will tend to pivot against the bias provided by the spring 25, thus disengaging the first end 26 of the catch element 24 from the abutment face 23.

Consequently the catch plate 21 is then free to rotate about the pivot axis 20. The mounting plate 16 will then tend to move pivotally about the mounting pivot 15 under the bias provided by the spring 28. As the head-rest 2 moves forwardly, so the pin 18 will move along the arcuate slot 22 as the catch plate 21 moves pivotally about the pivot axis 20. When the pin 18 reaches the upper end of the arcuate slot 22, forward movement of the head-rest 2 is arrested.

It is thus to be appreciated that in use of a head-rest arrangement as described, the forward movement of the head-rest will only be actuated in a rear impact situation and when the seat on which the head-rest arrangement is mounted is actually occupied.

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From the foregoing it is to be appreciated that the described catch arrangement acts as an initiator to initiate the forward movement of the head-rest. In the described embodiment the head-rest is biased forwardly by means of a spring but, in alternative embodiments of the invention, alternative
10 mechanisms would be provided to move the head-rest forwardly such as, for example, a pyrotechnic arrangement in which a pyrotechnic gas generator is actuated to generate gas which may be supplied to a piston-and-cylinder unit to move the head-rest forwardly.

15 Whilst the described connection bar 11, having the specific co-operation with the catch element 24, constitutes one example of an inertia sensitive normally released connection, other connections of this type can be devised.

In the present Specification "comprises" means "includes or consists of"
20 and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following Claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process
25 for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS:

- 5 1. A head-rest arrangement mounted on a vehicle seat, the head-rest arrangement incorporating a head-rest and a mechanism to move the head-rest forwardly from an initial position to a forward position, the mechanism being associated with an initiator operable to initiate the forward movement of the head-rest, the back-rest of the seat including a member moveable in response to
10 pressure applied to the back-rest of the seat, that member being associated with an inertia sensitive connection which is normally disconnected but which, with an inertia effect, may become connected to the said initiator such that movement of said member in the back-rest of the seat actuates the initiator to cause the head-rest to move forwardly.
- 15 2. An arrangement according to Claim 1, wherein the initiator constitutes a releasable catch, the head-rest being biased forwardly by means of a spring.
- 20 3. An arrangement according to Claim 2, wherein the head-rest is mounted for pivotal movement about a predetermined pivot axis, and the catch incorporates a pivotally mounted catch plate having a slot therein, the slot co-operating with a pin carried by the head-rest, the catch plate being associated with a catch element positioned to retain the catch in an initial position such that the engagement between the pin and the slot serves to retain the head-rest
25 in the first position, the catch element being moveable to a release position in which the catch plate is free to move pivotally, thus enabling the head-rest to move forwardly as the pin moves along said slot.

4. An arrangement according to Claim 3, wherein the catch element is pivotally mounted, one end of the catch element constituting the part of the initiator that is engaged by the said inertia sensitive connection.
- 5 5. An arrangement according to any one of the preceding Claims, wherein the inertia sensitive connection comprises an element that is pivotally mounted to the said member within the back-rest, and which is initially biased to a position in which the member is spaced from part of the initiator, the member being movable, under inertia, to a position in which part of the member engages
10 the said part of the initiator to constitute a connection such that movement of the member actuates the initiator.
6. An arrangement according to Claim 5, wherein said element is an elongate element provided with a serrated face to engage said part of the
15 initiator.
7. An arrangement according to Claim 5 or Claim 6, wherein the said element is resiliently biased to the first position.
- 20 8. A head-rest arrangement substantially as herein described with reference to and as shown in the accompanying drawings.
9. Any novel feature or combination of features disclosed herein.



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Application No: GB 0226124.6
Claims searched: 1 - 8

Examiner: Andrew P Jenner
Date of search: 25 April 2003

Patents Act 1977 : Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
X	1 - 2, 5	GB 2373177 A	AUTOLIV - see figures and page 6 lines 1 - 9
X	1 - 2, 5, 7	GB 2318045 A	DELPHI - see figures and page 3 lines 11 - 19
X	1, 5 - 7	GB 2316862 A	AUTOLIV - see figures and page 8 lines 2 - 4
X	1, 5, 7	EP 1134115 A2	IKEDA - see figures
X	1, 5, 7	EP 0627340 A1	GM CORP. - see figures
X	1 - 5, 7	WO 87/03256 A1	BOULAY - see slot and locking means in figures 2 - 5
X	1 - 7	US 6024406 A	FAURE EQUIP SA BERTRAND - see figures
X	1, 5, 7	US 6199947 A	SAAB - see figures

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^v.

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Worldwide search of patent documents classified in the following areas of the IPC⁷:

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The following online and other databases have been used in the preparation of this search report:

WPI, EPODOC, JAPIO
